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GB 2256649 A **GB 1331308 A** **GB 0741139 A**
WO 92/19898 A **WO 88/00987 A** **WO 85/00034 A**

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(54) **Electrolytic or galvanic water treatment device for reducing scale**

(57) The device for reducing nucleation and growth of scale deposits in a water system, comprises: a housing 2 having connection means at each end, each connection means being adapted to provide a connection to a pipe of a water supply system whereby water can flow through the housing for treatment by the device, a sacrificial anode eg. a zinc bar 20 (Fig. 2 not shown) located within the housing 2 and in contact with the water in the housing 2 and cooperable with a cathode eg. the housing itself made of copper to treat water flowing through the device, and a constriction 3, 4 being provided at each end of the housing 2 to retain the anode in the housing 2. The sacrificial anode and the cathode materials may have different electrode potentials.

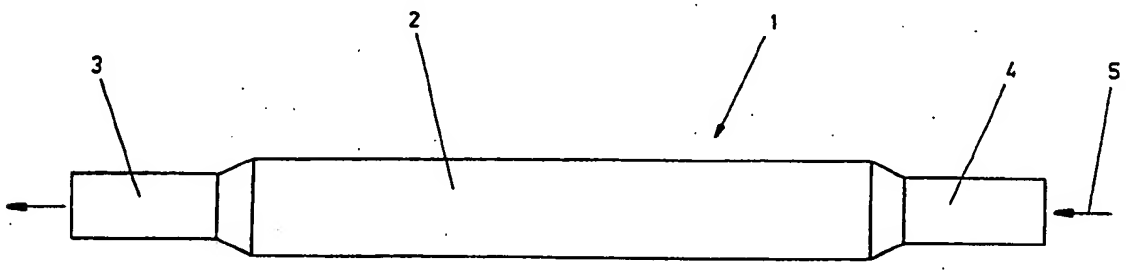

FIG. 1

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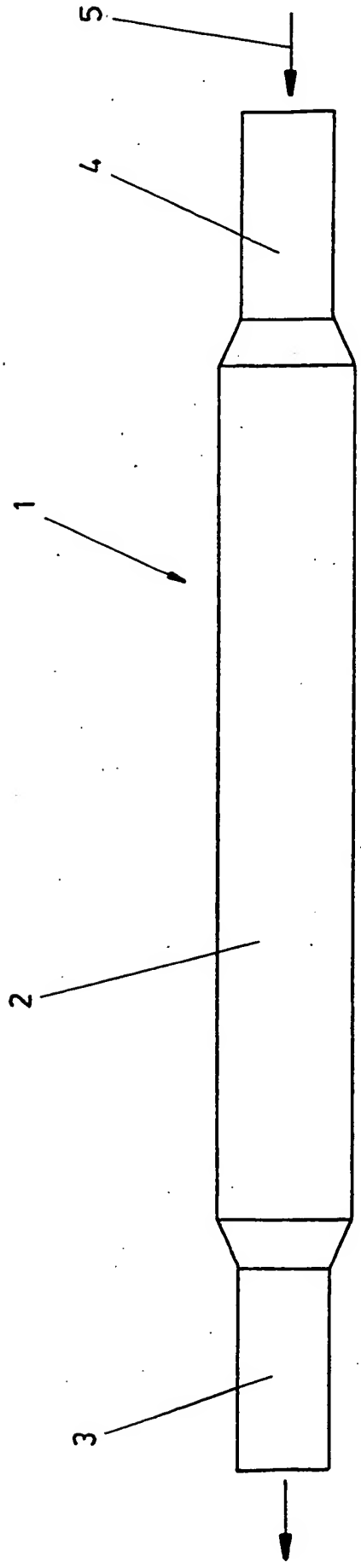

FIG. 1

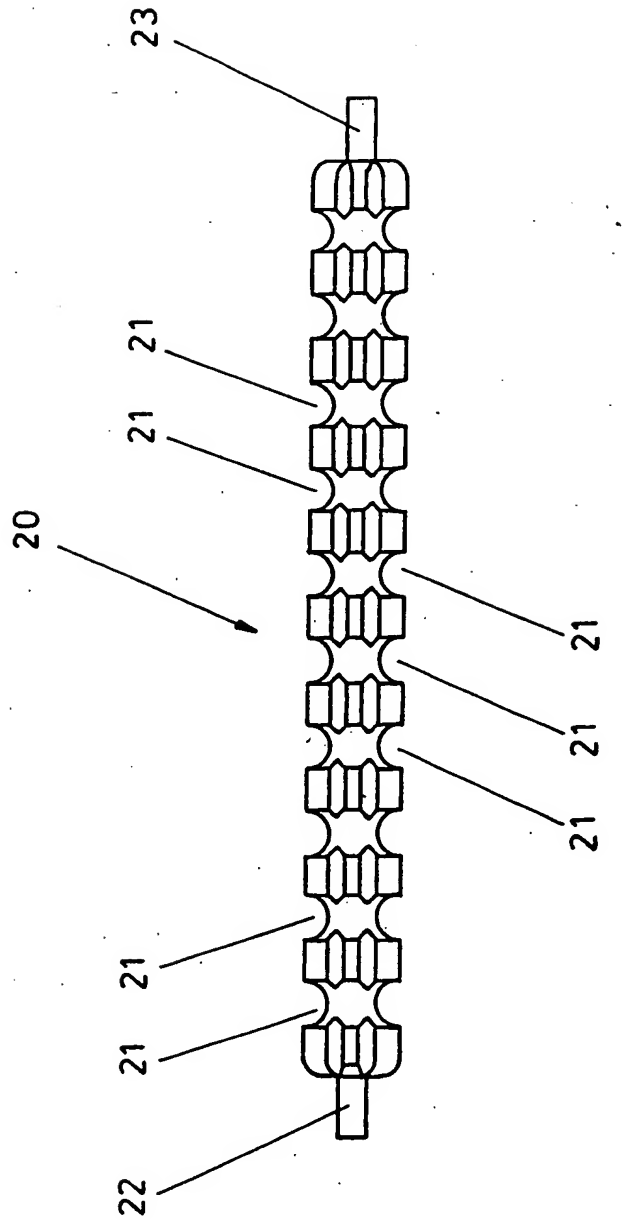

FIG. 2

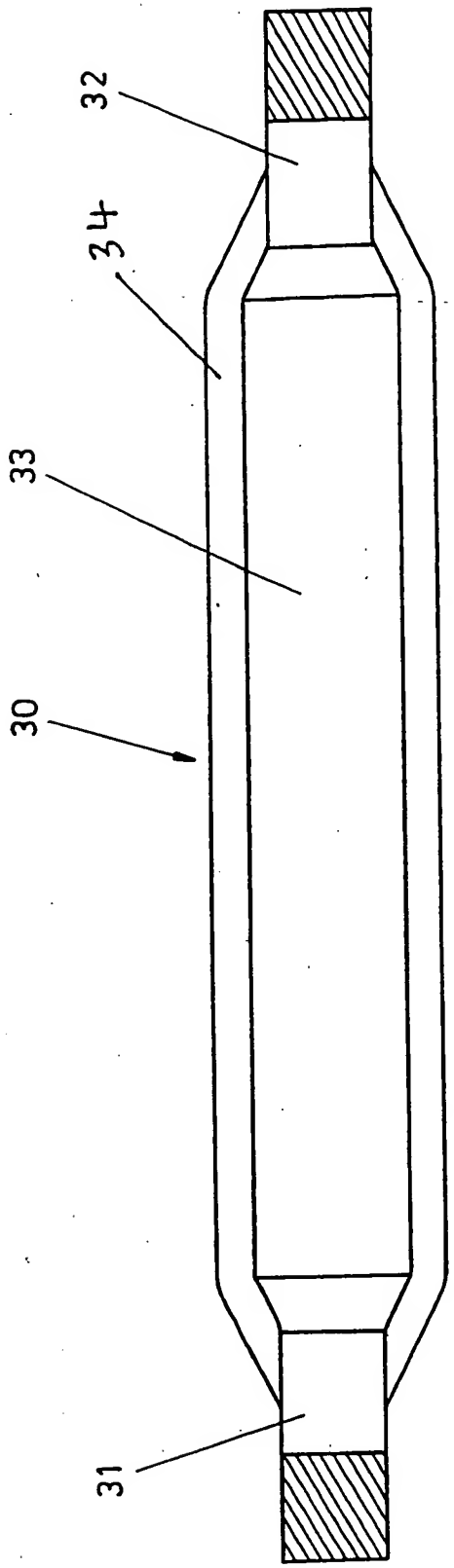

FIG. 3

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WATER TREATMENT DEVICE

This invention relates to a water treatment device of the type which uses an electrolytic process to reduce or minimise the formation of scale on the internal surfaces of pipes, boilers, and other surfaces exposed to water. The device is particularly, though not exclusively, suitable for use in treating hard water.

In areas supplied with water having a high mineral content there is a tendency for these minerals to become deposited on the internal surfaces of pipes and boilers. Some of these minerals are dissolved in the water, for example hydrogen carbonates (HCO_3^-), and these may undergo changes to form insoluble particles, for example calcium carbonate. These may be deposited on internal surfaces of pipes and boilers to form so-called hard water scale deposits. Other scale forming particles are insoluble and are held in suspension in the water.

Known water treatment devices generally comprise an anode and cathode placed in the flow or passage of water. Generally, the anode and cathode are contained within a section of tube comprising a central tubular jacket with a connector at each end. Each of the connectors are adapted to be fitted to a conventional water pipe. The cathode and anode are located within the central tubular jacket. The electrodes are formed from different materials and each has a different electrode potential when placed in contact with water. An electrolytic current is allowed to flow and small quantities of metal ions of the anode dissolve into the water. It is believed that the presence of small quantities of these dissolved ions affect the electronic charge distribution around scale forming particles. This minimises the nucleation and growth of solid scale deposits on the internal surfaces of pipes and boilers.

As the anode of these scale prevention devices is sacrificial ie. it gradually dissolves, the surface area of anode material presented to the water is reduced and the mass of anodic material reduces. This eventually leads to impaired performance and the device has to be replaced or

repaired. With known devices the anode is replaced and this involves using a construction of device whereby the tubular jacket, connectors, electrodes and spacers must be removable and serviceable. The known devices accordingly have a large number of individual components each of which must be removed by the service engineer when replacing the anode. This is a time consuming process and the large number of individual components also increases the cost of assembling the device during manufacture. The invention addresses these problems and seeks to provide a cost effective solution.

According to the invention there is provided a water treatment device for reducing the nucleation and growth of scale deposits in a water system, which comprises:

a housing having integral connection means at each end, each connection means being adapted to provide a connection to a pipe of a water supply system whereby water can flow through the housing for treatment by the device;

a sacrificial anode located within the housing to be in contact with the water in the housing and cooperable with a cathode of the device to treat the water; and

a constriction at each end of the housing to retain the anode in the housing

The water treatment device of the invention has the advantage that fewer individual components are required in the device. This improves the productivity of the manufacturing process and also reduces the time required for a service engineer to repair or replace the device. Over a period of time the sacrificial anode dissolves and requires replacement. The task of replacing the device is simplified as the whole unit is removed and replaced rather than just the anode. The old unit may be returned and the materials reprocessed thereby minimising the loss of materials.

The connection means may be adapted for use with standard pipe fittings to facilitate connection of the water treatment device to, for example, the rising main of a water supply to a house or building.

Preferably, the cathode of the device is formed on or

by the housing.

The sacrificial anode and the cathode may be formed from materials which have different electrode potentials. The anode releases ions into the water in an electrolytic process which does not need to be driven by an external power source. It is thought that the released ions modify the electric potential surrounding insoluble particles in the water and may also act as sites for nucleation and growth of scale deposits in the water instead of on the surfaces of pipes and boilers.

The housing may be externally coated in a plastics material. This improves the aesthetic look of the device and also permits product information to be printed on the device. In addition, the entire device may be contained within a protective casing.

Preferably, the anode is formed from zinc and the cathode is formed from copper. Alternatively, the anode comprises a plurality of discs spaced apart along a bar. In a preferred arrangement the housing is formed from copper and behaves as the cathode.

In a preferred arrangement, the anode comprises a bar supported within the housing and is retained within the housing by the constrictions at either end. This eliminates a number of components required in the device. In traditional devices a separate tubular jacket is provided with screw threads at each end adapted to accept separate connection means once the anode has been placed inside the jacket.

A preferred method of forming a water treatment device comprises inserting a sacrificial anode into a tubular housing and forming a constriction at each end of the housing to retain the inserted anode. This technique reduces the number of steps in the process to form the device and the number of individual components required.

Spacers or supports may be provided on the sacrificial anode, prior to insertion in the tube, to position the anode within the housing. The spacers are, preferably, formed from

a material which is unaffected by the electrolytic processes occurring within the device. The spacers will continue to support the anode as its size and mass diminishes with use.

Preferably, constrictions are formed on the ends of the housing by a swaging process. This avoids the need to join connectors to the housing by means of threads or soldering which tend to be sites of weakness in the finished product. In an alternative process constrictions may be formed in the ends of the device by a crimping process.

Generally, the spacers have an external dimension greater than the internal dimension of the constriction. The anode is retained within the tube. Furthermore, by using this technique it is possible to position and retain an anode which has an external dimension smaller than the size of the constriction.

An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is side view of a water treatment device according to the invention;

Figure 2 is a side view of a sacrificial anode used in the water treatment device shown in Figure 1; and,

Figure 3 is a cross-sectional view of a housing of the device shown in Figure 1.

Referring to the drawings in detail, Figure 1 shows a water treatment device according to the present invention and generally indicated by the reference numeral 1. The water treatment device comprises a tubular housing 2 having a central region bounded by two tubular constrictions 3 and 4. The central region and the two constrictions are integral and are formed from a single length of tube. The constrictions 3 and 4 are formed by a swaging process. A sacrificial anode (not shown in Figure 1) is supported within the central region of the housing and is prevented from falling or slipping out of the housing by the constrictions 3 and 4. This is achieved by providing spacers or supports (not shown) on the anode which have an external dimension greater than

the internal dimension of the constrictions 3 and 4. The constrictions are swaged on the housing once the anode has been inserted into the tube. However, if flexible spacers or supports are used the anode and spacers may be inserted after the tube has been swaged. The sacrificial anode is formed from zinc and the tube is formed from copper which behaves as the cathode.

The device is fitted to the water supply by inserting the pipe in a main water pipe. In use water flows through the device (indicated by the arrows 5) and is treated by the electrolytic processes occurring within the device. Ions are discharged into the water and these act to inhibit the nucleation and growth of scale forming particles on the internal surfaces of pipes and boilers.

Figure 2 shows in detail the shape of a zinc anode 20 which is retained in the housing. The anode comprises a bar of zinc with a plurality of depressions 21 around the circumference of the bar. These increase the surface area of the anodic material in contact with the water, and also guide the passage of water within the housing and around the anode, and therefore serve to improve the performance of the device. End formations 22 and 23 are adapted to engage with spacers or supports (not shown) which keep the anode substantially co-axial with the housing, and which spaces may be formed by plastics mouldings e.g. generally star-shaped (3 or more radially extending limbs) which fit on the end formations 22, 23. The anode 20 is retained in the housing by the swaged constrictions.

Figure 3 is a cross-sectional view of a copper housing 30 which has two constrictions 31 and 32 formed on the ends by swaging. The sacrificial anode is housed in the space 33 and is prevented from falling or slipping out of the housing by the constrictions 31 and 32.

The entire device is shielded or protected by a surrounding casing 34, preferably of moulded plastics.

CLAIMS:

1. A water treatment device for reducing the nucleation and growth of scale deposits in a water system, comprising:

a housing having integral connection means at each end, each connection means being adapted to provide a connection to a pipe of a water supply system whereby water can flow through the housing for treatment by the device;

a sacrificial anode located within the housing to be in contact with the water in the housing and cooperable with a cathode of the device to treat the water; and

a constriction at each end of the housing to retain the anode in the housing.

2. A water treatment device as claimed in claim 1, in which the connection means is adapted for use with standard pipe fittings to facilitate connection of the water treatment device.

3. A water treatment device as claimed in any preceding claim, in which the cathode of the device is formed on or by the housing.

4. A water treatment device as claimed in any preceding claim, in which the sacrificial anode and the cathode are formed from materials which have different electrode potentials.

5. A water treatment device as claimed in any preceding claim, in which the housing is externally coated in a plastics material.

6. A water treatment device as claimed in any preceding claim, in which the water treatment device is contained within a protective casing.

7. A water treatment device as claimed in any preceding

claim, in which the anode is formed from zinc and the cathode is formed from copper.

8. A water treatment device as claimed in any preceding claim, in which the anode comprises a plurality of discs spaced apart along a bar.

9. A water treatment device as claimed in any preceding claim, in which the housing is formed from copper and behaves as the cathode.

10. A water treatment device as claimed in any preceding claim, in which the anode comprises a bar supported within the housing and is retained within the housing by the constrictions at either end.

11. A method of forming a water treatment device comprises inserting a sacrificial anode into a tubular housing and forming a constriction at each end of the housing to retain the inserted anode.

12. A method of forming a water treatment device as claimed in claim 11, in which spacers or supports may be provided on the sacrificial anode, prior to insertion in the tube, to position the anode within the housing.

13. A method of forming a water treatment device as claimed in claim 11 or claim 12, in which the spacers are formed from a material which is unaffected by the electrolytic processes occurring within the device.

14 A method of forming a water treatment device as claimed in any one of claims 11 to 13, in which constrictions are formed on the ends of the housing by a swaging process.

15 A method of forming a water treatment device as claimed in any one of claims 11 to 13, in which constrictions are

formed in the ends of the device by a crimping process.

16 A method of forming a water treatment device as claimed in any one of claims 11 to 15, in which the spacers have an external dimension greater than the internal dimension of the constriction.

17. A water treatment device as substantially hereinbefore described with reference to the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) -9-	Application number GB 9313436.9
Relevant Technical Fields (i) UK Cl (Ed.M) C7B (BDVA, BDVB, BEMF, BEAM, BEME) (ii) Int Cl (Ed.5) C02F 1/46, 1/48	Search Examiner M J INSLEY Date of completion of Search 13 JUNE 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES: WPI	Documents considered relevant following a search in respect of Claims :- 1-17

Categories of documents

X:	Document indicating lack of novelty or of inventive step.	**P:**	Document published on or after the declared priority date but before the filing date of the present application.
Y:	Document indicating lack of inventive step if combined with one or more other documents of the same category.	**E:**	Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A:	Document indicating technological background and/or state of the art.	**&:**	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2256649 A	(SALAMANDER) see Figure 1	1, 2 at least
X	GB 1331308	(SOC DETUDES) see Figure 2	1, 2 at least
X	GB 0741139	(ROMAC) see Figure 1	1, 2 at least
X	WO 92/19898	(UDEN) see Figure 1	1, 2 at least
X	WO 88/00987	(CHAK et al) see Figure 1	1, 2 at least
X	WO 85/00034	(TARNPURE) see Figure 2	1, 2 at least

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).